

## Key Findings and Public Health Messages

- California Department of Public Health (CDPH) received reports of 603 cases of typhoid fever with estimated symptom onset dates from 2001 through 2008. This corresponds to an average incidence rate of 0.21 cases per 100,000 Californians.
- Typhoid fever incidence rates decreased by 12.5 percent from 2001 (0.24 per 100,000) to 2008 (0.21 per 100,000).
- During the surveillance period, 2 (0.3 percent) cases died with typhoid fever.
- Average typhoid fever incidence rates during the surveillance period were highest among children 1 to 4 years of age (0.38 per 100,000) and adults 25 to 34 years of age (0.34 per 100,000).
- From 2001 through 2008, 43 persons were reported as chronic typhoid carriers. One (2.3 percent) carrier died. Chronic carriers were more likely than acute typhoid fever cases to report older age (median age 47 years vs. 26 years) and Hispanic race/ethnicity (48.8 percent vs. 19.9 percent).
- For international travelers, a typhoid vaccine and care in selecting foods and drinks are important prevention measures.

## Background

*Salmonella* Typhi is an uncommon but important enteric and systemic bacterial pathogen in the United States (US), causing an estimated 400 cases per year. While uncommon in the US, typhoid fever is highly endemic in developing countries in Africa, Asia (especially Southeast Asia and the Indian subcontinent), and Central and South America. Most cases in the US are travelers returning from endemic areas. *S. Typhi* infection is restricted to humans, and food or water contaminated by the feces or urine of typhoid fever cases or carriers are the leading sources of exposure. There is no national *Healthy People 2010* target objective for typhoid fever.

Acute illness, usually gastroenteritis, occurs after an incubation that varies from 3 to over 60 days depending on size of the inoculum and host factors. Onset is often insidious. A carrier state may follow acute illness or mild or even subclinical infections. About 1.0 to 4.0 percent of untreated cases will become carriers and the chronic carrier state is more common among persons infected during middle age.

*S. Typhi* resistant to first-line drugs became so common by the 1990s, that fluoroquinolones became the drugs of choice for treatment. However, nalidixic acid-resistant *S. Typhi*, with decreased susceptibility to fluoroquinolones, and fluoroquinolone-resistance have now been reported in South and Southeast Asia. Two typhoid vaccines are currently available in the US. Both vaccines confer about 70.0 percent protection in older children and adults but neither is licensed for use in young children. Notably, vaccine-induced immunity provides little protection against large challenge doses.

We describe here the epidemiology of typhoid fever in California from 2001 through 2008. Data for 2008 are provisional and may differ from data in future publications. For a complete discussion of the definitions, methods, and limitations associated with this report, please refer to Technical Notes<sup>1</sup>.

## California reporting requirements and surveillance case definition

California Code of Regulations, Title 17, requires health care providers to report suspected cases of typhoid fever and carriers of *S. Typhi* to their local health department within one working day of identification or immediately by telephone if an outbreak is suspected. Laboratories must also notify the local health department when laboratory testing yields evidence suggestive of *S. Typhi*; notification

must occur within one working day after the health care provider has been notified.

Local health officers are required by regulation to report to CDPH cases of typhoid fever and carriers of *S. Typhi*. CDPH officially counted typhoid fever cases that satisfied the Centers for Disease Control and Prevention (CDC) surveillance case definition including confirmed and probable classifications. During the surveillance period, CDC defined a confirmed typhoid fever case as one with *S. Typhi* isolated from a clinical specimen. A probable case was one with clinically compatible illness and an established epidemiologic link to a laboratory-confirmed case during an outbreak. CDPH defined a convalescent typhoid carrier as a person who harbored typhoid bacilli for three or more months after onset of typhoid fever. A chronic carrier was: (a) a person who continued to excrete typhoid bacilli for more than 12 months after onset of typhoid fever or (b) (i) a person who gave no history of typhoid fever or who had the disease more than one year previously, and (ii) whose feces or urine were found to contain typhoid bacilli on two separate examinations at least 48 hours apart, confirmed by the CDPH Microbial Diseases Laboratory. CDPH defined other typhoid carriers as persons who had typhoid bacilli isolated from surgically removed tissues, organs, or draining lesions. If such persons continued to excrete typhoid bacilli for more than 12 months, he/she was a chronic typhoid carrier.

### Epidemiology of typhoid fever in California

CDPH received reports of 603 cases of typhoid fever with estimated symptom onset dates from 2001 through 2008. This corresponds to an average incidence rate of 0.21 cases per 100,000 Californians. Typhoid fever incidence rates decreased by 12.5 percent from 2001 (0.24 per 100,000) to 2008 (0.21 per 100,000). [Figure 1]. During the surveillance period, 2 (0.3 percent) cases were reported to have died with typhoid fever.

Average typhoid fever incidence rates during the surveillance period were highest among children 1 to 4 years of age (0.38 per 100,000) and adults 25 to 34 years of age (0.34 per 100,000) [Figure 2]. The ratio of male to female cases was 1.0:1.0. Incidence rates by race/ethnicity were not calculated due to the substantial portion of missing data (31.3 percent). However, typhoid fever cases with complete information reported Asian race

Figure 1. California typhoid fever case counts and incidence rates

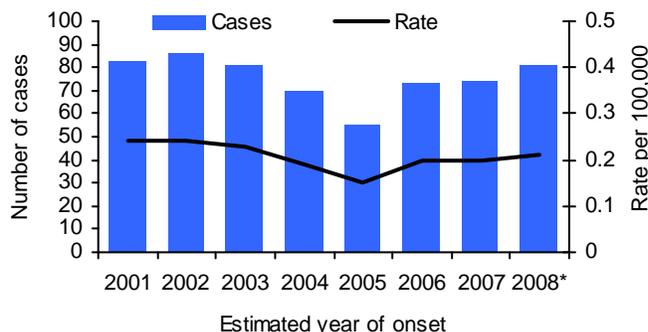


Figure 2. California typhoid fever incidence rates by age and time period

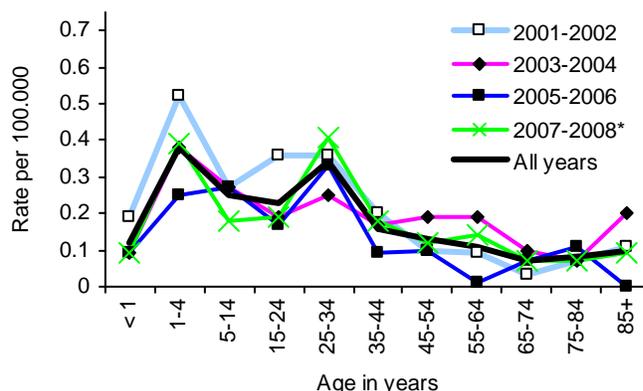
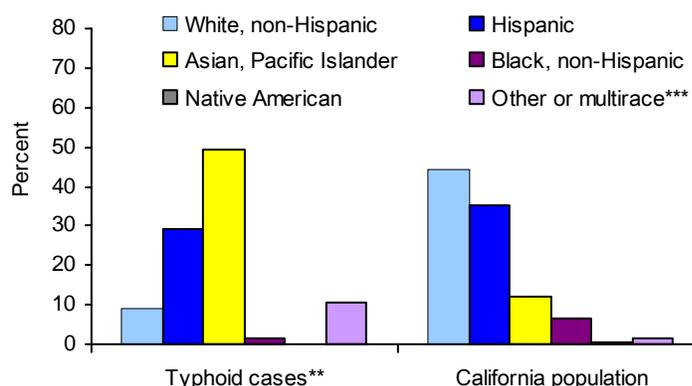


Figure 3. California typhoid fever cases and population by race/ethnicity 2001 - 2008\*



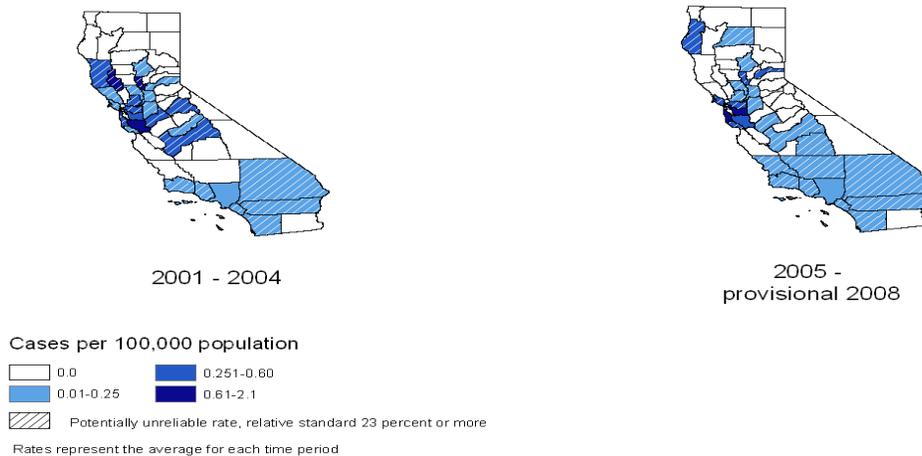
#### Legend for Figures 1-3

\*2008 data are provisional

\*\*Unknowns were excluded

\*\*\*Includes cases who identified 'other' as their race and Californians ('population') who identified more than one race

Figure 4. California county-specific typhoid fever incidence rates



much more frequently than would be expected based on the overall demographic profile of California [Figure 3].

Although the rate of typhoid fever decreased modestly from 2001 to 2008 for the state as a whole, some counties of California reported increased rates. The average incidence rate in the Sacramento Metro region for the combined years of 2005 through 2008 (0.13 per 100,00) was 1.6 times higher than during the combined years of 2001 through 2004 (0.08 per 100,00) [Figure 4]. Of note, many of the counties in this region have small populations and the rates are somewhat unstable.

From 2001 through 2008, 43 Californians were newly reported typhoid carriers. One (2.3 percent) carrier died. Typhoid carriers were more likely than acute typhoid fever cases to report older age (median age: 47 years vs. 26 years), and Hispanic race/ethnicity (48.8 percent vs. 19.9 percent).

#### Comment

On average, 75 cases of typhoid fever were reported annually in California from 2001 through 2008. These cases occurred predominantly among international travelers. Although uncommon in California and the US, two recent typhoid fever outbreaks illustrate the potential threat to public health associated with this disease. The first outbreak occurred in Florida in 1998, involved at least 16 cases, and was epidemiologically-linked to consumption of drinks made with frozen mamey prepared in Guatemala and Honduras. The second occurred in Nepal in 2002, involved 5,963 multidrug-resistant cases, and was traced to the city's water supply. These outbreaks illustrate that *S. Typhi* can pose an outbreak threat here in the US and that

drinking-water associated outbreaks can be very large.

Because of their public health importance, typhoid cases, contacts, and carriers in California are subject to special restrictions and public health supervision. California maintains a registry of all typhoid carriers. Convalescent carriers may be released from supervision by authority of the local health officer while chronic carriers can be released from local supervision only by authority of CDPH.

The recent global emergence of *S. Paratyphi A*, especially in southeast China, may have important implications for enteric fever control worldwide. *S. Paratyphi A* and *S. Typhi* are clinically indistinguishable. While treatment strategies are similar for both, *S. Paratyphi A* is not included in currently licensed vaccines and therefore not part of this critical prevention strategy.

For international travelers, while a typhoid vaccine confers some degree of protection, ensuring the safety of food and water is still the most important protective measure.

#### Resources and References

<sup>1</sup>Epidemiologic Summaries of Selected General Communicable Diseases in California, 2001-2008: Technical Notes

<http://www.cdph.ca.gov/data/statistics/Documents/technicalnotes-episummary-aug2409.pdf>

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